Duration of high school education on early fertility and marriage: evidence from a policy change in Ghana

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Abstract

Purpose – The objective of this paper is to examine the effect of spending one extra year in high school on early marriage and childbirth.

Design/methodology/approach – The study takes advantage of the education reform in 2007 that extended the years of high school education by one to conduct a quasi experiment. The marriage and fertility outcomes of women who completed a four-year senior high school education are compared to those who completed a three-year senior high school education.

Findings – The findings from the study indicate that the one-year extension in high school education led to a 4.75 percentage point reduction in the probability of ever marrying by age 27 and a 6.7 percentage point reduction in the probability of ever given birth. The authors demonstrate that the extension of the duration of high school education by one year has a heterogeneous effect, as it reduced the fertility and marriage outcomes of rural girls more than urban girls. The study reveals opportunity costs and confinement effects as possible mechanisms through which the policy affected early marriage and birth.

Originality/value – This study is one of the few studies that examine the impact of the duration of secondary school education on fertility and marriage. For Africa in particular, there is no such study. Thus, this study provides a unique contribution to the literature since available studies on this subject matter can only be found in advanced economies. Unlike other studies in Africa that use a design that provides the combined effect of duration of schooling and school enrolment on fertility and marriage, this design enables the authors to only look at the effect of duration of schooling on fertility and marriage.

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1. Introduction

In recent years, the average years of schooling in Sub-Sahara Africa (SSA) has been increasing, and coinciding with this is an observed downwards trend of early fertility and marriage. The education of the girl child has long been considered to be one of the most important development goals in many developing countries, especially for SSA, where the gender gap in education is very wide. Female education is believed to empower women to have more input into their timing of marriage and the total number of children they are likely to tolerate (Masuda and Yamauchi, 2018). The various benefits derived from educating the girl child have led to recent educational policies targeting the girl child, which has resulted in an increasing trend of female educational attainment.

In Ghana, policymakers realising the importance of education have implemented several policies to improve the gross primary and secondary school enrolment rate in the country. Thus, policies such as Free Compulsory Universal Basic Education (FCUBE), Capitation Grant, and most recently Free Senior High School education have been implemented in the country. These policies have caused improvement in both primary and secondary school enrolment rates. In the last decade for example, apart from 2014, the gross secondary school enrolment has been increasing year on year. For example, there was an increase in the gross enrolment ratio for secondary school students by three percentage points between 2019 and 2020 (Statista, 2023). Within these periods of increase in educational attainment, there is also a decline in both early marriage and fertility. Information from the District Health Information Management System (DHIMS) in the country indicates that 542,131 births were recorded amongst adolescent girls between ages 15–19 years and 13,444 pregnancies for teenagers between ages 10–14 were recorded within the same period. In 2021, the adolescent fertility rate (births per 1,000 women ages 15–19) in Ghana was reported to be 64.8%. In the case of a global trend in child marriage, there seems a consistent decline in child marriage, and a similar trend is also found in Ghana (Sarfo *et al.*, 2022). For example, child marriage declined from 27% in 2014 to 19.3% in 2018 (Ghana Statistical Service, 2014, 2018). As early as at age 15, 5% of girls in Ghana might have married and the figure increases to 19.3% by age 18 (Ghana Statistical Service, 2018).

In broad terms, the duration of education can delay childbirth and marriage via two main channels. First, keeping women in school reduces the probability of marrying early and the possibility of engaging in activities that could easily lead to unplanned births (Black *et al.*, 2008). This mechanism is simply referred to as the "confinement effect or incarceration effect" in the fertility literature. Second, spending more years in school may improve human capital development. This is because the extension of the years of secondary education would give teachers more time to explain course materials to students with lower academic abilities who may have been left behind under the three years duration of completing secondary. This would in effect increase the total human capital in the country. Moreso, overburdening students with an intensive workload owing to compressed curricula in a shorter duration of the educational system may affect the personality development of students (Thiel *et al.*, 2014). Generally, improvement in human capital enhances one's employment opportunities. However, child care is time intensive, and therefore, as the value of a woman's time increases, she is likely to delay her marriage and reduce the number of children she would be given birth to so that she could increase her participation in the labour market (Schultz, 1981; Becker, 1991). Like most of the fertility literature, we would be referring to this mechanism as "opportunity cost".

Several empirical papers on the effect of education on fertility point to a negative causal relationship between education and fertility (see, *inter alia*, Keats, 2018; Ozier, 2018; Cheng and Guo, 2022; Angko *et al.*, 2022; Jung and Jung, 2022). In contrast, few studies have found no relationship between education and fertility (see, *inter alia*, MCcrary and Royer, 2011; Geruso and Royer, 2018; Bellés-Obrero *et al.*, 2023) and a positive relationship between education and

fertility (Fort *et al.*, 2016; Chen, 2022). All the empirical studies that have found no relationship between education and fertility come from the developed world, where educational attainment is very high and fertility is also very low.

Our extensive review of the literature on the effect of education on fertility shows only two studies in Africa that are closely related to our paper in terms of the nature of the educational policy that they adopted for their analysis. In those two studies, Kenyan educational reform, which increased primary education by one year, is used as an instrument for years of education, and Egyptian educational reform, which cuts the years of primary education from 6 to 5 years, is adopted (Férré, 2009; Ali and Gurmu, 2018). Both of these papers established a negative causal relationship between education and fertility. The difference between this study and those two earlier studies is that their study adopted a policy framework that affected primary education, while this study uses a policy framework that affected secondary education. Since completion of primary school occurs at a much younger age than that of secondary school, policies that manipulate the years required to complete primary school may not have the same impact on fertility as policies that are likely to manipulate the years required to complete secondary school.

Moreover, we can closely relate our paper to studies that focus on high school education and fertility outcomes. Existing evidence on high school education and fertility outcomes in SSA comes from access to secondary school education (see Duflo *et al.*, 2021; Ozier, 2018). These studies found a strong negative causal relationship between access to secondary education and early marriage and fertility outcomes. Our study differs from the above studies in two ways. First, while our study compares individuals with similar characteristics who spent different years in high school, earlier studies compare individuals with similar characteristics, of whom some received access to secondary schools and others did not. Second, unlike the other studies that adopt education subsidy policies, test scores, or massive construction of school buildings as instruments that eventually evaluate the combined effect of an increase in the years of education (through retention) and an increase in the number of people schooling (through an increase in enrolment), this study measures only the effect of a change in the years of education on fertility but not the combined effect of years of schooling and increase in enrolment.

The rest of the paper is organised as follows: Section 2 briefly provides information on the educational reforms and policies in Ghana. Section 3 describes the sources of data and definitions of variables. In Section 4, I discuss the empirical framework and provide explanations for the internal validity of the empirical design. Section 5 reports the main findings, and Section 6 concludes.

2. Background to educational policies in Ghana

Although several of the educational reforms that have happened in the country target improving enrolment and retention, two of them have concentrated on changing the duration of instruction and/or restructuring the syllables (Akyeampong *et al.*, 2007). The first educational policy that changed the duration of pretertiary education occurred in 1987. Before 1987, the minimum number of years required to complete preuniversity education was either 15 or 17 years depending on whether the individual wanted to pursue university education or other forms of tertiary education. The reform changed the existing structure from 17 or 15 years of pretertiary education to 12 years. The 12 years pretertiary comprised 6 years primary, 3 years junior high, and 3 years senior high (Akyeampong *et al.*, 2007; Boahen *et al.*, 2020). The 1987 educational structure continued until the years were again changed in 2007.

In 2007, the 6-3-3 preuniversity educational structure that had been used since 1987 was changed to 6-3-4. The argument for the change in the duration of high school education from

three to four years by the Government of Ghana at the time was to improve the quality of teaching and performance of students at that level. Although the reform in 2007 replaced the existing three years of high school education with four years, the high school curricula were still maintained. Unfortunately, after implementing the four-year high school education for only three academic years, a newly elected government reverted the duration to three years. Exogenous changes in the duration of high school education in the country can be used as a natural experiment to study the effect of changing the duration of high school education on fertility outcomes [1].

3. Data source, sample, and definition of variables

The data analysed here come from the sixth wave of the Ghana Living Standard Survey (GLSS6) [2] collected in 2012/2013. Information on ever married, ever given birth, ever gotten pregnant, age of beginning primary 1, high school education, ethnicity, religion, employment, formal employment, age, parental occupation and parental education are taken from the dataset. In the dataset, individuals aged 17 years or above were seen to have completed at least high school. To ensure that the treated cohort is not relatively too young compared to the control cohort, we constrain the sample to include females from ages 17–27 years [3]. Thus, the sample for the study is limited to women whose highest level of education is high school completion. This is because one cannot tell from the dataset whether an individual who is or has completed tertiary school used the three- or four-year high school system.

Restricting the sample to include four- and three-year high school graduates and women aged 17–27 years gives a total sample size of 1,080. The dummy variable (1 if one attends a four-year high school) is derived from two variables: (1) highest level of education completed and (2) highest grade completed at that level [4]. We redefine the poverty status variable in the GLSS dataset and call it welfare by combining very poor and poor households as poor and then maintaining the nonpoor household. Table 1 gives descriptive statistics of our main outcome variables and independent variables.

Apart from religion and age, the test of the mean difference for the rest of the independent variables is insignificant. The results from the test of the mean difference between the control and treated cohorts indicate that the reform is exogenous. Almost 89% of the sampled respondents are non-poor. Approximately 84% of the sampled observations are Christians, and the most dominant ethnic group forms approximately 51% of the sampled observations. Parental educational characteristics for the treated cohort are not different from those for the control cohort. The table indicates that 34% of the fathers of the sampled observation have at least a high school education, whereas that of their mothers is only 14%. In terms of the main outcome variables, the table indicates that high school graduates who attended four-year programs are less likely to marry, get pregnant, or give birth by the age of 27.

4. Empirical framework and internal validity checks

4.1 Empirical framework

The empirical strategy used in this study exploits a policy in Ghana that extended high school education in the country by a year for three consecutive years. The marriage and fertility outcomes of individuals who were exposed to the policy are compared to those who were not. By exploiting the exogenous variation of the reform, we estimate the equation below:

$$y_{ijktc} = \alpha_o + \alpha_1 D_c + \alpha_2 X_{ijktc} + \gamma_j + \delta_t + \delta_t * Region_k + \epsilon_{ijkt} \quad (1)$$

where y_{ijktc} denotes marriage and fertility characteristics of girl i in district j, region k, born in year t, and completed school in cohort c, $D_c = 1$ [if the duration of high school is 4 years], X_{ijktc}

	Full sample			Treated cohort (HS_4)			Control cohort (HS_3)			
	Mean	S.D	*N*	Mean	S.D	*N*	Mean	S.D	*N*	*p*-value
Age	21.95	2.69	1,080	21.04	2.08	338	22.37	2.84	742	0.00
Religion(1 if Christian)	0.84	0.36	1,080	0.88	0.32	338	0.83	0.38	742	0.02
Welfare(1 if non-poor)	0.89	0.31	1,080	0.87	0.33	338	0.90	0.30	742	0.20
Location(1 if Savana)	0.25	0.44	1,080	0.23	0.42	338	0.27	0.44	742	0.19
Urbanisation(1 if urban)	0.70	0.46	1,080	0.71	0.45	338	0.69	0.46	742	0.44
Age started primary school	6.62	1.17	1,080	6.53	1.07	338	6.66	1.21	742	0.10
Ethnicity										
1 if Akan	0.51	0.50	1,080	0.55	0.50	338	0.50	0.50	742	0.07
1 if Ewe	0.11	0.31	1,080	0.11	0.31	338	0.11	0.32	742	0.75
1 if Mole-Dagbani	0.17	0.38	1,080	0.14	0.35	338	0.19	0.39	742	0.06
1 if other ethnic group	0.20	0.40	1,080	0.20	0.40	33	0.20	0.40	742	0.84
Education of father										
At most primary	0.27	0.45	1,080	0.29	0.45	338	0.27	0.44	742	0.52
Junior high school	0.38	0.49	1,080	0.37	0.49	338	0.39	0.49	742	0.69
High school/TVET	0.14	0.35	1,080	0.13	0.34	338	0.14	0.35	742	0.51
Tertiary	0.20	0.40	1,080	0.21	0.41	338	0.20	0.40	742	0.73
Education of mother										
At most primary	0.47	0.50	1,080	0.44	0.50	338	0.48	0.50	742	0.16
Junior high School	0.40	0.49	1,080	0.42	0.49	338	0.40	0.49	742	0.36
High school/TVET	0.08	0.27	1,080	0.08	0.27	338	0.08	0.27	742	0.92
Tertiary	0.05	0.22	1,080	0.06	0.24	338	0.05	0.21	742	0.26
Occupation of father										
Professional	0.35	0.47	1,080	0.32	0.47	338	0.36	0.48	742	0.19
Production sales	0.16	0.36	1,080	0.17	0.37	338	0.15	0.36	742	0.70
Agriculture	0.46	0.50	1,080	0.48	0.50	338	0.45	0.50	742	0.35
Not working	0.03	0.17	1,080	0.03	0.18	338	0.03	0.17	742	0.89
Occupation of mother										
Professional	0.07	0.25	1,080	0.07	0.26	338	0.06	0.25	742	0.70
Production sales	0.50	0.50	1,080	0.47	0.50	338	0.51	0.50	742	0.21
Agriculture	0.39	0.49	1,080	0.41	0.49	338	0.38	0.49	742	0.35
Not working	0.0	0.20	1,080	0.04	0.21	338	0.04	0.19	742	0.68
Fertility outcomes										
1 if ever married	0.16	0.37	1,080	0.06	0.25	338	0.20	0.40	742	0.00
1 if ever pregnant	0.19	0.39	1,080	0.09	0.29	338	0.24	0.42	742	0.00
1 if ever given birth	0.16	0.37	1,080	0.07	0.26	338	0.20	0.40	742	0.00

Note(s): S.D represent standard deviation and N represent the sample size
Source(s): Authors own calculation from wave 6 of the Ghana Living Standard Survey (GLSS6)

Table 1.
Descriptive statistics

is a vector of control variables that are likely to affect fertility outcomes (religion, ethnicity, an indicator for residing in an urban area, an indicator for living in the northern savanna zone of the country, and an indicator for poverty status), δ_t is the set of birth year fixed effects, γ_j represents district fixed effect and $\delta_t * Region_k$ is an interaction between the birth year dummies with regional dummies.

The birth year fixed effects (δ_t) absorb any possible differences across cohorts that may potentially affect secondary schooling, marriage, and fertility of the girl child. For example, the extension in years of education without corresponding investment in infrastructure may lead to overcrowding, which may affect teaching and learning and could affect the desire of

girls to stay in school. However, these nationwide changes are captured by cohort effects. The district fixed effects capture time-invariant district characteristics. Finally, the inclusion of the interaction between δ_t and $Region_k$ would absorb any possible asymmetric changes across regions over the cohorts. For example, the anticipation of the effect of the policy on school attendance within disadvantaged regions might cause policymakers to divert more resources to those regions. Fertility and marriage outcomes in this study are measured dichotomously and in that regard the study adopted a linear probability modelling estimation technique to estimate equation (1).

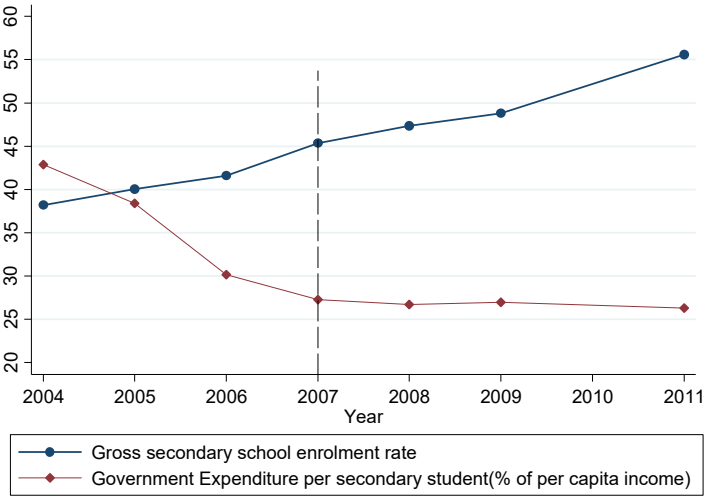
4.2 Identification and internal validity checks

The implementation of the 2007 reform was purely random. Thus, the individual and household characteristics of girls who entered the three-year secondary were no different from their counterparts who used the four-year secondary. Figure 1 is an indication that the extension in the years of secondary education did not influence the gross secondary school enrolment in the country and that the government did not change per capita student expenditure due to the implementation of the policy. From the figure, it can be seen that the trend of gross enrolment in secondary school before the reform is no different from the trend of gross secondary school enrolment rate after the reform. The balancing test of the covariates in Table 1 supports our claim that the reform was random, and therefore, cohorts who entered the secondary school before and after the 2007 reform can be compared.

5. Results

5.1 Effects of the duration of high school education on early marriage and fertility

This section examines the impact of the reform on early fertility and marriage by comparing the outcomes of individuals enrolled in the four-year high school education with those enrolled in the three-year high school education. Columns (1), (2), and (3) in Table 2 report the results of the probability of ever being married by age 27, ever being pregnant by age 27, and ever giving birth by age 27, respectively. All regressions reported in this section use the



Source(s): Databank.worldbank.org

Figure 1.
School enrolment and government expenditure on per secondary school student

	Outcomes		
	(1)	(2)	(3)
	1 if ever Married	1 if ever Pregnant	1 if ever Given birth
1 if high school duration is 4 years	−0.0475**	−0.0631**	−0.0672***
	(0.0198)	(0.0247)	(0.0219)
	[0.16]	[0.19]	[0.16]
	{1,080}	{1,080}	{1,080}

Note(s): Robust standard errors, clustered at the district level are in parenthesis. Mean of the control group in braces and sample size below mean. All the estimations include cohort-specific regional fixed effects (10 regions), birth year fixed effects, and district fixed effects (261 districts existing in 2013). All regression estimates control for a dummy for a geographical zone, a dummy for urbanity of community, a dummy for welfare, a dummy for religion, ethnicity
* denotes significance at the 10% level
** at the 5% level
*** at the 1% level
Source(s): Authors own calculation from wave 6 of the Ghana Living Standard Survey (GLSS6)

Table 2.
Duration of high school on early marriage and fertility

specification described in equation (1). As seen in column (1) of the table, there is a 4.75% point decrease in the probability of ever marrying for women who completed the four-year high school education. On average, 20.48% of women in the control cohort had ever married by the age of 27. Hence, the result suggests a 23.2% (0.0475/0.2048) reduction in the probability of ever marrying for the treated cohort compared to the mean of the control cohort.

The result is consistent with the evidence presented by Keats (2018) and Férré (2009) but contradicts the findings of Lavy and Zablotsky (2015). The results in columns (2) and (3) show that the probability of ever being pregnant (given birth) for the treated cohort is 6.3 (6.7) percentage points lower than that for the control cohort. Our finding is consistent with a similar study conducted in Ghana by Duflo *et al.* (2021). They found that students who won a scholarship to attend secondary school were 7% points less likely to have been given birth by age 26 years. In contrast, our finding is contradictory to a study by Ozier (2018), who found an inconsistent result on the effect of access to secondary school education on teenage fertility in Kenya.

5.2 Heterogeneous effect of the reform on a different subpopulation

The impact of the reform on early marriage and ever given birth may be heterogeneous for the following reasons. First, the income level of some households may affect the decision of girls to enter marriage immediately after completing secondary school education. For example, children from wealthier households can easily be supported by their parents to learn a trade or may be supported to start a new business even if their grades from secondary school are not good enough to enter tertiary school. Any of this assistance is likely to cause a delay in marriage and fertility [5]. However, children from poorer households who are unable to access tertiary school are more likely to enter into marriage and childbirth, right after school—parents of these children may not have enough resources to assist them in learning a new trade after the sacrifices they had made in enrolling them in high school. This means that keeping high school girls one more year in school is likely to reduce the early marriage and fertility of girls from poorer families.

On the other hand, children from poor households who may go to high school are likely intelligent enough to pass the high school graduation exams since parents in poor households

would only sacrifice household consumption to finance high school education for only brilliant children. If this is the case, then children from poor households who attend secondary school are likely to further their education up to tertiary school, and therefore, the policy is unlikely to affect the early marriage and fertility of such children. Whether the reform would affect early fertility and marriage of poor and nonpoor households in the same or opposite direction is a matter of empirical question.

Second, the reform is likely to have a different effect on the different ecological zones in the country, especially between the northern and southern zones. Compared to the southern zone, the northern zone has low soil fertility, less high school infrastructure, and more rural communities. The northern zone is dominated by Islam, whereas those living in the southern zone are predominantly Christians. Moreover, the traditions and cultures within the northern zone have not drastically evolved compared to those in the south. The three northern regions are predominantly savanna, and the rest of the regions are predominantly rainforest—we use a dummy 1 for all the northern savanna zones and call it savanna. The apriori expectation is that the reform would have more impact on girls living in the nonsavanna zone since secondary school enrolment is higher in the nonsavanna zone than in the savanna zone.

Third, the reform is likely to impact communities differently depending on the community's development. Most underdeveloped communities still hold on to customs that approve of the early marriage of the girl-child. However, these customary practices are mostly absent in urban communities, and therefore, keeping high school girls in school for one more year is likely to have more impact in rural communities. This is because many traditional and opinion leaders in most rural communities are likely to advise families to allow their girl child to complete school before coercing them into marriage.

In testing for the heterogeneity effect of the reform, we conduct our analysis on four different subgroups: welfare (poor versus nonpoor), urbanisation (rural versus urban), geographical zone (savanna versus nonsavanna), and religion (Christian vs non-Christian). The results are reported in Table 3. Part A of the table shows the results for early marriage, and part B reports the results for ever given birth. Columns (1) and (2) show regression results for the different subgroups, and the third column provides the results of the test of equality of the coefficients within groups for married individuals. Similarly, Columns (4), (5), and (6) present results for ever given birth.

The results of Part An in Table 3 indicate a differential effect on welfare status, geographical zone, urbanisation, and religion. The regression estimate suggests that the reform has a higher effect on nonpoor households than poor households, and Welch's t-statistics for the test of mean difference in column (3) suggest that the difference in the magnitude between the two welfare classifications is statistically significant. A possible reason why the extension in secondary school education could not alter the probability of children from poor households marrying might be that those children from poor households who were able to be enrolled in secondary school might have demonstrated special academic abilities—thereby generating the interest of household members to sacrifice some of their needs for their education. Thus, such girls are likely to further their education after high school. In that case, the extension of the duration of secondary education by one additional year is unlikely to manipulate the timing of marriage and birth of such girls.

The result suggests that the reform reduced the probability of ever marrying for Christians by 9% points, which is significant, but for non-Christians, it is not significant. Moreover, the reform greatly influenced the probability of marriage amongst girls in rural communities more than amongst those in urban communities. The table also reveals that keeping girls in the savanna zone one more year in secondary school significantly reduced their probability of marrying early than those in the nonsavanna zone. Welch's t-statistics is significant.

Outcome		Part A Ever married			Part B Ever given birth	
Sub-population	(1)	(2)	(3)	(4)	(5)	(6)
By welfare	*Poor*	*Non-poor*	*Test of equality*	*Poor*	*Non-poor*	*Test of equality*
	−0.04*	−0.14**	34.5	−0.06***	−0.15***	44.1
	(0.019)	(0.051)		(0.019)	(0.041)	
	[0.019]	[0.17]		[0.14]	[0.17]	
	{118}	{962}		{118}	{962}	
By geographical zone	*Savanna*	*Non-Savanna*	*Test of equality*	*Savanna*	*Non-Savanna*	*Test of equality*
	−0.07	−0.04***	10.13	−0.13**	−0.05***	36.8
	(0.052)	(0.016)		(0.043)	(0.018)	
	[0.19]	[0.15]		[0.20]	[0.15]	
	{274}	{806}		{274}	{806}	
By Religion	*Christian*	*Non-Christian*	*Test of equality*	*Christian*	*Non-Christian*	*Test of equality*
	−0.07***	0.10	43.3	−0.09***	0.10*	47.5
	(0.018)	(0.0604)		(0.021)	(0.055)	
	[0.15]	[0.22]		[0.16]	[0.20]	
	{912}	{168}		{912}	{168}	
By Urbanisation	*Urban*	*Rural*	*Test of equality*	*Urban*	*Rural*	*Test of equality*
	−0.01	−0.17***	92.1	−0.005	−0.13***	88.46
	(0.021)	(0.036)		(0.018)	(0.033)	
	[0.15]	[0.18]		[0.14]	[0.21]	
	{753}	{327}		{753}	{327}	

Note(s): Robust standard errors, clustered at the district level are in parenthesis. Mean of the control group in braces and sample size below mean. Columns 3 and 6 present the test of equality using the Welch's t-statistics. Columns (3) and (6) shows the test that the effect of the extension of the duration of high school on the probability of given birth before age 27 is equal for the different subpopulations. Welch's t-statistics is 5% significant if |t|>1.96. All the estimations include cohort-specific regional fixed effects (10 regions), birth year fixed effects, and district fixed effects (261 districts existing in 2013). All regression estimates control for a dummy for the geographical zone, a dummy for urbanity of community, a dummy for welfare, a dummy for religion, ethnicity

* denotes significance at the 10%level

** at the 5% level

*** at the 1% level

Source(s): Authors own calculation from wave 6 of the Ghana Living Standard Survey (GLSS6)

Table 3. Heterogeneity effect of the reform on ever married and ever given birth by age 27

Like that of marriage, the reform is expected to have a heterogeneous effect on ever given birth. Part B of the table presents the results of the heterogeneity effect of the reform on the probability of ever giving birth by age 27. The estimated results in Part B of the table suggest that the percentage point decline in the probability of ever given birth by age 27 is similar to that of the results obtained for the probability of ever married by age 27 presented in Part A of Table 3, and Welch's t-statistics for the test of differences within each group are also similar to that of the results obtained in part A of Table 3.

5.3 Mechanisms

From the literature, there are five main channels through which educational policies might affect fertility: knowledge effect, opportunity cost, household bargaining and autonomy, confinement effect, and assortative mating. Out of these five mechanisms proposed in the

literature, only two of them were tested due to data limitations. The two that would be tested are opportunity cost and confinement effect. Table 4 shows the results of investigations of the impact of the duration of high school education on some outcomes likely to reflect each of the two mechanisms.

First, the increase in years of high school education may increase the opportunity cost of early marriage and birth only if the additional years of high school education improve human capital development. It is most likely that an extra year of high school education will improve human capital, and the improvement in human capital may increase the probability of obtaining employment in well-organised institutions. The increase in employment opportunities is likely to cause an increase in the value of a woman's time, which may then cause a delay in their marriage and childbirth. This is because marriage and child-rearing are time-intensive activities, and the culture of Ghanaians sees those activities as the primary responsibilities of women. The results presented in Table 4 indicate that the variables used as proxies for the opportunity cost of early marriage and birth are significant. The regression results suggest that the treated cohorts are 10% points more likely to be employed. We tested the impact of the reform on employment in formal sector wage employment. The rationale behind using this proxy as a test of opportunity cost is that the demands of formal sector wage employment are most likely to be less flexible compared to informal sector employment (such as informal self-employment, contributing family worker, etc.

Thus, working in formal wage employment may delay marriage and childbirth. Contrary to our *a priori* expectation, the results in Table 4 suggest that there is no difference in formal wage sector employment between the treated cohort and the control cohort. The

Outcome	1 if high school duration is 4 years
Opportunity cost	
1 if employed	0.10**
	(0.037)
	[0.39]
	{1,080}
1 if formal sector wage employment	−0.01
	(0.01)
	[0.06]
	{1,080}
Confinement effect	
1 if ever given birth before age 22 years	−0.04**
	(0.017)
	[0.08]
	{760}
1 if ever married before age 22 years	−0.018*
	(0.012)
	[0.09]
	{760}

Note(s): Robust standard errors, clustered at the district level are in parenthesis. Mean of the control group in braces and sample size below mean. All the estimations include cohort-specific regional fixed effects (10 regions), birth year fixed effects, and district fixed effects (261 districts existing in 2013). All regression estimates control for a dummy for a geographical zone, a dummy for urbanity of community, a dummy for welfare, a dummy for religion, ethnicity, father education, and mother education

* denotes significance at the 10%level

** at the 5% level

*** at the 1% level

Source(s): Authors own calculation from wave 6 of the Ghana Living Standard Survey (GLSS6)

Table 4. Mechanisms

insignificance may be that those criteria for selection to formal wage employment may depend on the certificate rather than the duration used to complete that level of education. Thus, formal wage sector employers treated certificates of the three-year and four-year high schools equally. A similar study of the effect of the 2007 reform on employment has been conducted by Abekah-Nkrumah *et al.* (2019), and their findings are consistent with this finding.

Evidence from Table 4 shows the confinement effect as a possible pathway through which the reform affected fertility. The confinement effect used here in this paper is the same as what Black *et al.* (2008) termed the incarceration effect. To estimate the confinement effect, we limit the dataset to include only females with at most 22 years. This is because if the one extra year of confinement in high school has any effect on the outcome variables, it must be seen at the early stages after high school. Suppose we assume no repetition and late entry and use the average age of starting primary one to be eight years (see Boahen and Yamauchi, 2018); then, the treated cohort is most likely to finish high school by the age of 20 years and the control cohort by the age of 19 years. Providing an allowance of two years for any marriage arrangement or actions that may lead to childbirth, we tested the confinement effect by restricting the sample to individuals with at most 22 years of age [7]. Estimated results show that for women of at most age 22 years, one extra year in high school reduces the likelihood of ever given birth and ever engaged in marital affairs. The results shown in Table 4 indicate that one extra year in high school reduced the probability of both ever giving birth and ever marrying by three and one percentage point, respectively. This evidence of the confinement effect is similar to that found in a study conducted in Uganda by Keats (2018), who found a significant effect of education on early fertility.

6. Conclusion

This study investigates the causal link between the duration of high school education and reproductive outcomes by adopting an educational reform in Ghana that was implemented in 2007 as a natural experiment. The evidence presented in this paper is based on a regression design that compares the outcomes of women exposed and unexposed to the reform. The study confirms the negative causal relationship between the duration of education on ever given birth and ever married that has been found in the literature. The results imply that a one-year extension in high school education due to the 2007 reform decreased early marriage by 4.75% points and early birth by 6.7% points. The results suggest that the reform impacted some subgroups within the population differently. We found the reform to have a stronger impact on early marriage and birth of women living in rural communities than their counterparts in urban communities. Similarly, there is evidence that the reform had more impact on early marriage and birth of Christian women, girls living in the savanna belt, and girls living in a nonpoor household than their counterparts who are non-Christians, living in a nonsavanna ecological zone, and poor households, respectively. Finally, we found some evidence that shows that the 2007 reform affected early marriage and fertility through the confinement effect and opportunity costs.

As established in the education and fertility literature, early marriage and fertility have negative consequences on the health of women, which usually leads to household conflict. The findings suggest that extending the years of high school education can be an effective way to reduce early marriage and childbirth, particularly amongst girls living in rural Ghana. The findings from this study may apply to other developing countries that share similar characteristics, such as Ghana. Although this study focusses on the effect of extending the duration of high school education on fertility, there may be more benefits of increasing the duration of high school education, which include but are not limited to improvement in human capital development and female labour force participation. It may be fruitful for future research to explore those benefits.

The first limitation of the study is that it assumes homogeneity of girls with three-year and four-year schooling. However, people can argue that the change in the years of high school completion may also change both the direct and indirect costs of education, which is likely to make those girls enrolled in the four-year secondary education different from their counterparts enrolled in the three-year education. In this circumstance, using the fuzzy regression design to estimate intention-to-treat (ITT) is appropriate. We tried abandoning the homogeneity assumption and adopting the fuzzy regression discontinuity design, but due to low enrolment in high school in Ghana and the small size of our sample, the ITT estimate detected only a small effect and was not significant. Given the balancing test and the education enrolment statistics for the three-year and four-year secondary schools provided in the study, the authors believe that assuming homogeneity may not be out of place. Future studies with larger sample sizes can explore fuzzy regression discontinuity, which uses a data-driven selection procedure to select the appropriate bandwidth length where the characteristics of girls between three years and four years of high school education are well balanced.

The second limitation of the study is that the use of pre-enrolment characteristics, such as household income, value of assets, and age of high school enrolment to conduct the balancing test, would have improved the balancing test presented in Table 1. However, due to the limitations of the dataset, we could only have access to parental education and occupation as the pre-enrolment variables to serve as proxies for household income and the value of household assets. In terms of the age of high school enrolment, we only have access to the age of primary school enrolment. Future studies with rich information on pre-enrolment characteristics could use it to strengthen the argument concerning the homogeneity assumption across the two durations of completing high school. Notwithstanding these data limitations, the study may serve as a foundational study of the impact of the duration of high school on fertility outcomes in a developing country using a national dataset that future studies can build upon.

An additional recommendation for future studies is that this study principally focussed on the impact of the policy on early fertility, and the analysis of the policy can further be extended to completed fertility to ascertain whether the delay in marriage and childbirth translates into a reduction in overall fertility. In this study, the quality of students who graduated from the four-year high school and that of the three-year system has not been investigated due to data limitations. Future studies can investigate the impact of the reform on the quality of graduates from high school since the fertility literature suggests a knowledge effect as one of the possible pathways through which education affects fertility.

Notes

1. Note that the reform only altered the duration of high school but the curriculum was not changed.
2. The GLSS6 survey covered a period of 12 months beginning from 18th October 2012 to 17th October 2013.
3. On average, Ghanaians usually complete high school from the ages of 17–22. Given that the reform was implemented in 2007 and GLSS6 was collected within 2012/2013, the older females in the treated cohort are most likely to be around age 27 years.
4. The highest level an individual completed measures whether the individual completed (no education, Kindergarten, Primary, Junior Secondary, Senior/High School, etc.) and the highest grade completed provides information on the number of years completed at that level. In effect, to know whether an individual completed four years of secondary or three years of secondary education requires these two variables.

5. Only a small proportion of high school graduates in the country can access tertiary education. This is because of inadequate tertiary educational facilities in the country—the examination requirement for tertiary education is therefore very high.
6. The confinement effect could have been better captured if the author estimates ever given birth at age 19 or 20 years for all women older than 19 years. However, the author could not do this because of data limitations. The data the author uses does not capture age at first marriage and age at first birth and if the author decides to limit the dataset to include only women who are 19 and 20 years, the sample size would significantly shrink to only 245 observations. A small sample size coupled with large variations in ever given birth and ever married may lead to inconsistent estimates and a large standard error.

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